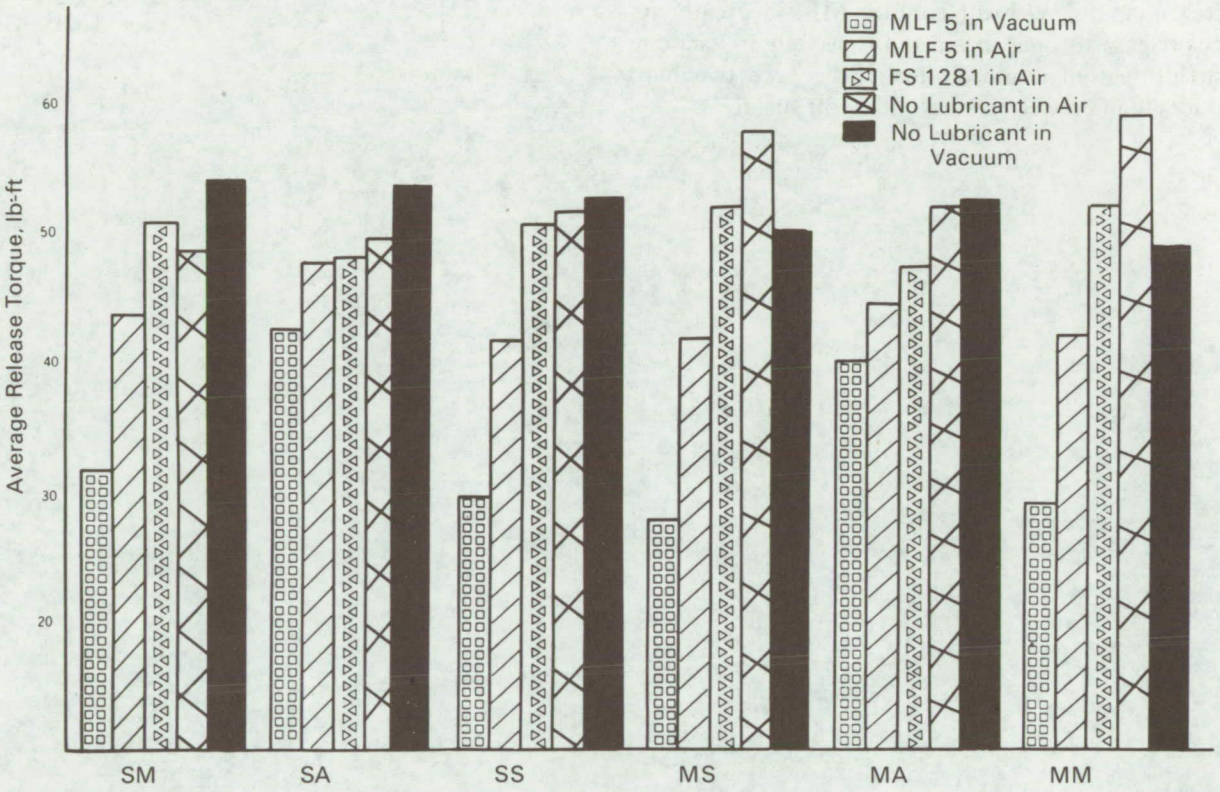
NASA TECH BRIEF

Comparison of Release Torques of Tightened Bolts in Vacuum and Air



Average Release Torques for Six Couples

Release torques were determined in air and in partial vacuum (10^{-6} to 10^{-7} torr) for 0.5-in. NC-2 bolts tightened to 60 lb-ft. The bolt-nut couples were as follows: stainless-steel bolts in nuts of stainless steel (SS), mild steel (SM), and aluminum (SA); and mild-steel bolts in nuts of stainless steel (MS), mild steel (MM), and aluminum (MA). All couples were tested with and without two lubricants: FS-1281, a fluorosilicone; and MLF-5, a sodium silicate bonded dry-film lubricant containing MoS_2, graphite, and gold powder.

Without lubrication and in air the release torque was highest with SM and MS couples; in vacuum, only SA showed significantly higher torque, but all couples except MM suffered some galling of threads. In air, application of FS-1281 made all release torques

(continued overleaf)

more constant, yet the average torque remained high–within 7 or 8 lb-ft of the tightening torque. The danger of contamination of the (vacuum) ion pumps prevented tests with the grease under vacuum.

In air, application of MLF-5 to the bolt threads significantly reduced all release torques. In vacuum the same lubrication reduced dramatically the overall-average release torque to roughly 50% of the tightening torque; both SA and MA couples showed release torques about 70% higher than those for pairings of the harder metals.

It is concluded that release torque is a function of material, lubricant, and environment. Without lubrication the torque varies little between air and vacuum, but galling is more probable in vacuum. Grease FS-1281 reduces torques only slightly but makes them more constant. With all couples MLF-5 greatly reduces release torques in air and especially in vacuum; such lubrication is more effective between two hard surfaces than between a hard and a soft surface.

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.65)

Reference:
NASA-TM-X-53936 (N70-17607) Bolt Torque Tests in Vacuum

Patent status:

No patent action is contemplated by NASA.

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